ISL Engineering and Land Services

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Village of Lions Bay

Final Report

Bridge Inspection Program

June, 2018

ISL Engineering and Land Services

ISL Engineering and Land Services Ltd. is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

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APPENDICES

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1.0 Introduction

1.1 Summary

ISL was commissioned by the Village of Lions Bay to perform a detailed Level 1 Inspection for eight (8) bridges owned by the Village.

This report includes details on the collection of field data for the Level 1 Inspection program and its requirements, and summarizes the rating system used in the Bridge Inspection Reports.

The results from the inspection program for each of the structures is tabulated in the Bridge Inspection Forms found in Appendix A. Inspections and rating systems for the Bridge Inspection Forms are described in detail in Section 2.0.

The purpose of the summary sheets is to provide a summary of all the field observations, structural residual life estimate, asset condition rating, identified work and cost estimate by period and finally a detailed cost estimate. Each component of the structures was assigned a condition rating based on either the material or the performance of the particular element on the structure. As indicated in the Bridge Inspection Form, the numerical rating chosen for the main structural components and their subcomponents ranged from 5 (excellent) to 1 (very poor).

1.2 Scope of Work

ISL completed a detailed hands on inspection on eight bridges owned by the Village of Lions Bay. Figure 1.2 on the following page outlines the location of each of the structures inspected. Items inspected include superstructure, deck, pier, abutments, secondary structural components, non-structural components (railing, utilities, light standards, joints, drainage, catch basins, wearing surface), road alignment and scour susceptibility. All deficiencies were recorded on Bridge Inspection Forms during the inspection. Photos were also taken showing the bridge profile, major structural components and any deficiencies.

Information noted during the inspection included:

- Bridge length & width,
- Structure type,
- Number of spans, and
- Utilities.

Timber floor beams and decking were visually examined and hammer sounded to determine the presence of rot. Concrete decks were visually examined and chain dragged to determine delamination areas. Underside of precast concrete box girders were visually examined and hammer sounded.

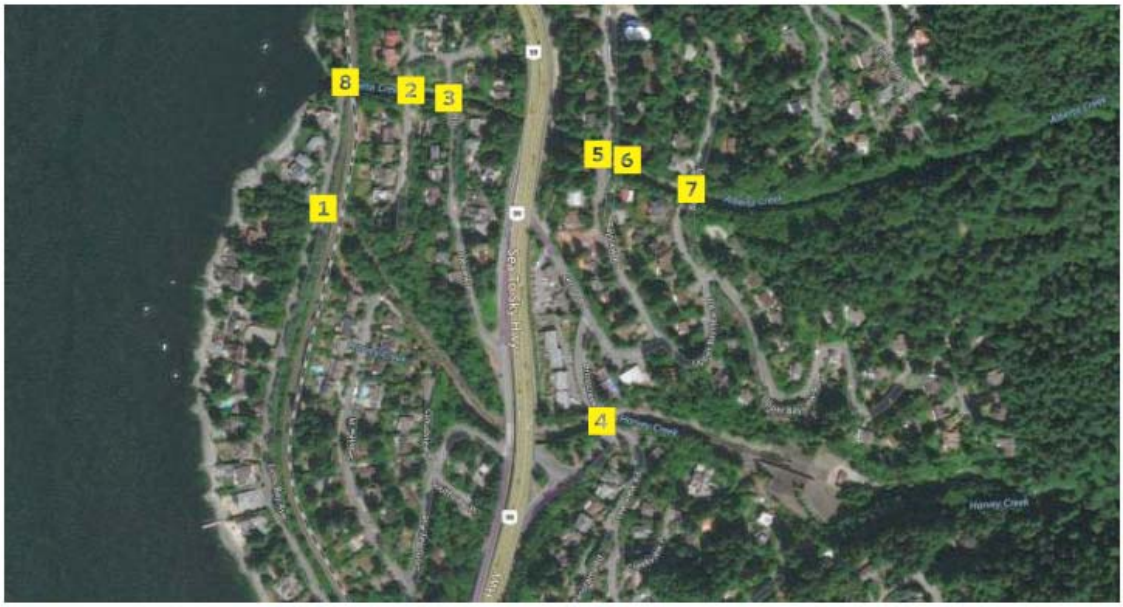

Figure 1.2: Location of Bridges Inspected

1.3 Inspection Teams

Prior to starting the inspection program, we reviewed and examined all of the previous inspection reports completed by AECOM in 2015 and existing bridge drawings supplied by the Village. The bridge inspections were completed by Luc Bittner, EIT, and Maria Kapiturova, EIT. Luc is the lead bridge inspection from ISL's Saskatoon's office. He has completed accredited inspection courses using the Ontario Structures Inspection Manual (OSIM) and has inspected over 150 bridges. Maria has completed the Bridge Construction Inspection – Level 1 course by the Centre for Transportation Engineering and Planning (C-TEP). The inspections were completed on November 8, 2017 and November 9, 2017.

1.4 Inspection Equipment

The standard equipment list employed for the inspection of each of the structures was included in our proposal.

The equipment required for a routine bridge inspection falls into the following main categories:

- Personal equipment
- Tools
- Specialized equipment

1.4.1 Personal Equipment

Personal equipment includes clothing and personal safety equipment, such as a hardhat, high visibility vest and steel-toed boots. Fall arrest equipment was used on the snooper truck.

1.4.2 Tools

Tools used for the bridge inspection are listed below:

- Flat bladed screwdriver - for general cleaning and probing
- Small scraper - for cleaning
- Pocket knife
- Chipping hammer
- Tape measures - 3 m and 30 m
- Pencils, pens, chalk, lumber crayons and markers
- Clipboard, inspection forms or field notebook
- Flashlight (spare batteries)
- Camera and film (spare batteries)
- Plumb bob and 4' carpenter's level
- Thermometer - for measuring the ambient temperature
- Rods - for checking undermining of footings
- String line for measuring the offset of bent steel members
- Unit for crack thickness measurement
- The inspection vehicle must also be equipped with an approved fire extinguisher and first aid kit

1.4.3 Specialized Equipment

The need for specialized equipment depends on the type of structure and access considerations at the site. The following list provides some examples of specialized equipment:

- Non-destructive testing equipment such as ultrasound equipment (Level 2)
- Survey equipment
- Traffic control equipment
- Snooper truck

The only specialized equipment used for this inspection program was the snooper truck and traffic control truck and personnel.

2.0 Bridge Inspection Report

The Bridge Inspection Report form is a standard form used by ISL. The bridge structure and components condition rating scale will follow the condition rating scale developed by the American Association of State Highway and Transportation Officials (AASTHO). The condition rating definition is described in the table below.

Table 2.1. Condition Rating

Rank	Definition	Description
5 / E	Excellent	No problems noted
4 / G	Good	Acceptable, but maintenance required
3 / F	Fair	Functioning, but rehabilitation required
2 / P	Poor	Not functioning, major rehabilitation required
1 / V	Very Poor	Critical, collapse imminent

In general, excellent is considered as new condition. Good condition indicates normal wear and deterioration requiring minor regular maintenance. A fair condition implies minor defects, deterioration or collision damage which would require some repair. A poor condition means advanced deterioration, significant defects or collision damage and major repair is required. A structure in critical condition would have serious defects, deterioration or collision damage and imminent failure of component requiring immediate repair or replacement and/or load restrictions.

An Urgency (URG) rating represents the overall asset condition assigned to the bridges. The Urgency rating is based on the lowest condition rating of the primary components. The urgency rating definition is described in the table below. Refer to the Table 2.3 in the following section of this document for the URG rating for each component of the structure.

Table 2.2: Urgency Rating

Rank	Definition	Description	Monitor
4	Excellent /Good	No structural deficiencies, little or no repair required	5 years or more
3	Fair	Minor structural deficiencies, requiring minor repair	< 3 years
2	Poor	Significant structural deficiencies, requiring repair/replacement	< 2 years
1	Very Poor/ For Closure	Severe deficiencies requiring immediate attention	ASAP

The components evaluated include:

- Deck
- Superstructure (beams/girders, slabs, stringers, floor beams, lateral bracing, diaphragms)
- Substructure (abutment, piers, pier columns)
- Channel/Protection
- Retaining/Wing Walls
- Wearing Surface
- Approach Roadway
- Bearings

- Expansion Joints
- Parapet/Railing/Barrier

Components that were not inspected due to accessibility are noted with X – "Cannot Inspect" on the inspection forms.

The report also contains space to include the following additional information:

- Structure identification – name and designated number
- Structure location (GPS coordinates)
- Structure dimensions
- Number of travel lanes
- Utilities carried
- Structural material(s)
- Information pertinent to the date and time of the inspection
- Inspectors - names of all inspection personnel
- Posted weight restrictions (if applicable)
- Posted hazard warning signs
- Explanations or comments on photos

Table 2.3: Lions Bay Bridges – Summary of Inspection Reports

Bridge	Condition Rating	Urgency Rating
B1. Lions Bay Avenue Bridge over Harvey Creek	G	3
B2. Isleview Place Bridge over Alberta Creek (Lower)	G	4
B3. Isleview Place Bridge over Alberta Creek (Upper)	G	4
B4. Cross Creek Road Bridge over Harvey Creek	G	4
B5. Bayview Road Bridge over Alberta Creek	G	4
B6. Bayview Road Bridge (Driveway Access) over Alberta Creek	G	3
B7. Bayview Place Bridge over Alberta Creek	G	4
B8. Lions Bay Avenue Bridge over Alberta Creek (Driveway Access)	G	3

3.0 Summary of Findings

ISL has include the Bridge Inspection Reports in Appendix A. The name, number of spans and number of lanes are included. The condition ratings for deck, substructure, superstructure and retaining walls/wing walls are provided for each structure. In addition, any component with a fair condition rating (≤ 6) was noted. Urgent recommendations for each structure are provided.

3.1 Design Life

Clause 1.4.2.3 in the CAN/CSA S6-14 Canadian Highway Bridge Design Code states that all new structure shall be designed for a 75 year design life, unless otherwise approved. This clause also specified in the CAN/CSA S6-06 and S6-00 codes as well. Earlier versions of the bridge code was based on the Ontario Highway Bridge Design Code (1983, 1991), which did not explicitly state a design life. However, many structures designed to the OHBDC are still is use today.

The actual design life of a structure may be different due to a variety of factors. Environmental factors (applications of road salts, snow buildup, freeze-thaw), bridge use (traffic volumes), construction issues (deficient materials, poor construction) and maintenance schedule (regular vs. irregular) can all affect the design life of a structure. Due to these unknowns, for this report, all bridges have an assumed design life of 75 years.

The estimated design life and residual design life is shown in Table 3.1.

Table 3.1: Lions Bay Bridges – Residual Design Life

Bridge	Bridge Length	Bridge Width	Design Life	Remaining Life
B1. Lions Bay Avenue Bridge over Harvey Creek	18.85m	6.3m	75 yr	Drawings not available
B2. Isleview Place Bridge over Alberta Creek (Lower)	18.1m	6.5m	75 yr	43 yr
B3. Isleview Place Bridge over Alberta Creek (Upper)	18m	6.5m	75 yr	43 yr
B4. Cross Creek Road Bridge over Harvey Creek	20m	11.4m	75 yr	Drawings not available
B5. Bayview Road Bridge over Alberta Creek	17.91m	10.1m	75 yr	43 yr
B6. Bayview Road Bridge (Driveway Access) over Alberta Creek	19.5m	3.9m	75 yr	43 yr
B7. Bayview Place Bridge over Alberta Creek	18m	6.5m	75 yr	43 yr
B8. Lions Bay Avenue Bridge over Alberta Creek (Driveway Access)	14m	3.6m	75 yr	43 yr

3.2 Replacement Costs

ISL has included an estimated replacement cost for each bridge structure. The cost is based on a per square meter unit cost calculated from recent construction costs for similar sized bridge projects. Due to funding requirements, several municipalities have recently separated bridge projects into three phases: detailed design phase, tender phase, and construction phase. The completed detailed design package cannot be completed and filed until addition resources can be procured for the tender and construction phases. The time between 100% detailed design stage and start of construction can vary between months or years.

To assist the Village for budgeting purposes, Table 3.2 shows the costs for construction of the replacement bridge structures only. The unit cost for the bridge replacement varies based on the type of structure. The costs are hard

replacement costs (based on current bridge construction practices in BC). Amortization has not been built into these costs. We recommend that the Village increase the replacement cost to account for inflation if replacement will not occur in the next couple of years. All bridges in the Village are Type 1 bridges except Bridges B1 and B8. B1 is considered a Type 2 bridge because of the cost of cast-in-place concrete girders. Bridge B8 is considered a Type 2 bridge because of the non-standard precast concrete section used. The Village does not have any Type 3 bridges, however, the cost is provided for reference.

Table 3.2: Construction Bridge Costs

Structure Type		Cost
Type 1	Small precast concrete box girders/I girders, steel girder concrete deck composite (short spans)	$4500/m^2
Type 2	Steel girders, large precast concrete I girders (medium span)	$5000/m^2
Type 3	Long span structures (> 50m)	$6000/m^2

Table 3.3: Associated Fees

Associated Service	% of Total Construction Costs
Engineering and Management Services	12%
Environmental	0-1%
Utility Relocation	0-5%
Amortization	Depends on period of replacement (TBD)

Associated fees (engineering design, tendering and project management services, environmental services, third party relocation services, etc.) can be estimated as a percentage of the construction costs, between 10% and 17%. An average associated fee of 14% is used to determine total bridge replacement costs. A construction contingency cost of 25% has been included in the total costs. This corresponds to a Class C cost estimate (25%-40%) This is shown in Table 3.4.

Table 3.4: Total Bridge Replacement Costs

Structure Type	Construction Cost	Associated Cost	Replacement Cost	25% Contingency	Total Replacement Cost
Type 1	$4500/m^2	$630/m^2	$5130/m^2	$1282.50/m^2	$6412.50/m^2
Type 2	$5000/m^2	$700/m^2	$5700/m^2	$1425/m^2	$7125/m^2
Type 3	$6000/m^2	$840/m^2	$6840/m^2	$1710/m^2	$8550/m^2

Table 3.5: Lions Bay Bridge Replacement Costs

Bridge	Deck Area	Associated Costs	Construction Costs	Replacement Costs
B1. Lions Bay Avenue Bridge over Harvey Creek	118.76m^2	$83,128	$763,001	$846,129
B2. Isleview Place Bridge over Alberta Creek (Lower)	117.65m^2	$74,120	$680,311	$754,431
B3. Isleview Place Bridge over Alberta Creek (Upper)	117.00m^2	$73,710	$676,553	$750,263
B4. Cross Creek Road Bridge over Harvey Creek	228.00m^2	$143,640	$1,318,410	$1,462,050
B5. Bayview Road Bridge over Alberta Creek	180.89m^2	$113,961	$1,046,002	$1,159,964
B6. Bayview Road Bridge (Driveway Access) over Alberta Creek	76.05m^2	$47,912	$439,759	$487,671
B7. Bayview Place Bridge over Alberta Creek	117.00m^2	$73,710	$676,553	$750,263
B8. Lions Bay Avenue Bridge over Alberta Creek (Driveway Access)	50.40m^2	$35,280	$323,820	$359,100

3.3 Maintenance/Rehabilitation Costs

ISL has provided recommended maintenance/rehabilitation items for each bridge. The various maintenance and rehabilitation items are listed below.

Maintenance items

- bridge load capacity rating
- removal of debris
- monitoring of erosion
- monitoring of steel corrosion
- monitoring of concrete cracks
- monitoring of asphalt cracks
- monitoring of settlements and deformations
- monitoring/record damage to structural components

Rehabilitation items

- replacement of scour protection
- replacement of damaged or deficient structural members (beams, piles, deck, railing, etc.)
- repair of concrete structural members (cracks, spalls, delamination)
- asphalt repair or rehabilitation
- bearing replacement
- sealing of concrete members
- railing anchor bolt replacement
- steel bracing connection repair

Based on the structural condition, recommended time frame for these repairs have been identified as < 1 year (urgent), 1 – 3 year and 3 – 5 year repairs. Table 3.7 summarizes the maintenance costs for each time frame. As above, the costs include a 25% contingency.

Table 3.6: Bridge Costs

Bridge	Recommendation	Time	Costs	Remaining Life
B1. Lions Bay Avenue Bridge over Harvey Creek	Repair concrete girders	1 yr	$4,000	Drawings not available
	Repair concrete curb	1 to 3 yr	$500	
	Repair handrail	1 to 3 yr	$3,000	
	Regrade embankments	1 to 3 yr	$15,000	
B2. Isleview Place Bridge over Alberta Creek (Lower)	Remove vegetation	3 to 5 yr	$3,500	43 yr
	Seal deck and sidewalk	1 to 3 yr	$17,650	
	Seal asphalt cracks	3 to 5 yr	$500	
	Replace railing bolts	1 to 3 yr	$750	
B3. Isleview Place Bridge over Alberta Creek (Upper)	Remove vegetation	3 to 5 yr	$750	43 yr
	Seal deck and sidewalk	1 to 3 yr	$17,550	
	Seal asphalt cracks	3 to 5 yr	$500	
	Replace railing bolts	1 to 3 yr	$750	
B4. Cross Creek Road Bridge over Harvey Creek	Extend bridge drain	3 to 5 yr	$750	Drawings not available
	Seal deck and sidewalk	1 to 3 yr	$34,200	
	Repair concrete at South abutment	1 to 3 yr	$3,000	
	Seal asphalt cracks	1 to 3 yr	$500	
B5. Bayview Road Bridge over Alberta Creek	Remove vegetation	3 to 5 yr	$3,500	43 yr
	Seal deck and sidewalk	1 to 3 yr	$27,250	
	Seal asphalt cracks	3 to 5 yr	$500	
B6. Bayview Road Bridge (Driveway Access) over Alberta Creek	Replace timber floor beams	1 to 3 yr	$15,000	43 yr
	Clean steelwork	1 to 3 yr	$20,000	
	Replace diaphragm connection	1 yr	$3,000	
	Replace timber bearing beam	1 yr	$10,000	
	Replace railings	1 to 3 yr	$11,000	
B7. Bayview Place Bridge over Alberta Creek	Remove vegetation	3 to 5 yr	$3,500	43 yr
	Seal deck and sidewalk	3 to 5 yr	$17,600	
	Repair concrete at abutment	1 to 3 yr	$5,000	
	Replace railing bolts	1 to 3 yr	$750	
B8. Lions Bay Avenue Bridge over Alberta Creek (Driveway Access)	Replace railing	1 to 3 yr	$7,700	43 yr
	Remove vegetation	1 to 3 yr	$3,500	
	Inspect U/S of bridge (no snooper truck access)	1 yr	$5,000	

Table 3.7: Bridge Rehabilitation Cost Summary

	< 1 year	1 to 3 year	3 to 5 year
Bridge Rehabilitation	$22,000	$183,100	$31,100
25% Contingency	$5,500	$45,775	$7,775
Total	**$27,500**	**$228,875**	**$38,875**

3.4 Recommended Inspection Schedule

ISL details the recommended frequency of inspections in the section below.

Frequency of Inspections

Each highway bridge within British Columbia is presently inspected on an annual basis. Since the traffic densities and the age of the structures in the municipality are not much different than that of the Province, we recommend that bridges with a condition rating of F (Fair) or lower be inspected every year. All other structures with higher condition ratings can be inspected every two years. At the present time, we recommend two possible types of inspections, described as follows:

Annual Inspections

Visual inspections of each bridge in the Village should be done annually. All components that are readily accessible are to be visually inspected. This includes deck, railings, parapets and some abutments. Inspections of the girders requires specialized equipment and is not included in the annual inspection.

However, if during this inspection a defect is obvious on any part of the structure where access requires special equipment, arrangements must be made to provide access to inspect that defect. Annual inspections are also required for structures with have critical damage/defects which could put the structure in jeopardy. These include any bridges that have a component with a condition rating of F or worse.

Five Year Inspections (comprehensive inspections)

Detailed inspections should be completed every five years. Detailed inspections require that the entire structure be thoroughly inspected using whatever means of access may be required.

Municipalities with a larger database of bridge structures aim to complete a five year inspection on twenty percent of their structures in any given year. However, due to the cost of special access equipment (snooper truck), ISL recommends that the Village complete detail inspections of all eight bridges in the same inspection year. Newly constructed bridges must be inspected before the warranty expires. The first “five-year” inspection would be done 5 years after the warranty expiration date.

Level 2 Inspections

Based on the results of the Level 1 inspection no additional Level 2 Testing is required for any of the bridges inspected.

However, we recommend detailed visual inspection be completed on the soffit and abutments of the Bridge 08 with the rope access or drone, as they were not inspected as part of this inspection program. ISL used a snooper truck for the bridge inspections and the vehicle was not able to travel onto the bridge due to the size restrictions.

If you have any questions regarding the contents of this report, please call the undersigned.

Yours Truly,

ISL Engineering and Land Services

Janet Tong, P.Eng.
Senior Structural Engineer

Daniel Estey, P.Eng.
Manager, Bridge Design and Construction

Appendix A

Bridge Inspection Reports

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 01
GPS Readings: LC, N: 5478681.14 E: 482635.83
HC, N: 5478660.03 E: 482632.28
Inspection Type: L1 **Inspection Date:** 9-Nov-17

Structural Material: Cast in Place Concrete
Location: Lions Bay Avenue over Harvey Creek, Vilage of Lions Bay
Construction Date:
Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey
Time: 11:15 A.M. **Weather:** Cloudy, 10 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)	100						No noticeable debris build up upstream.
2 Bank/Bed Scour/Buildup (P,S)				100			Evidence of severe scour at abutments directly under the bridge. Underside of abutment is visible.
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		100					Light scaling typical throughout with vertical hairline to narrow cracks.
3 Wing/Retaining Walls (S)				100			Masonry retaining wall at South abutment is only covering the downstream half of the bridge.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs		100					Light scaling typical throughout.
6 Bearings (S)						N	
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)		95	1	4			Light scaling and rusted chairs typical throughout with regular vertical hairline cracks spaced at approximately 700mm o/c. Severe delaminations on Girder 2 Span 2 near midspan. Spalling with exposed corroded reinforcing on Girder 2 at North Abutment. Light spalling from impact damage on Girder 1 on Span 2 near midspan.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)		100					Light scaling typical throughout with localized vertical hairline to narrow cracks.
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)		85	1	14			Hairline cracking typical throughout. Light to severe spalling with suspected delaminations typical throughout soffit exteriors. Severe delaminations typical on Span 2 at Piers. Severe spalling with exposed corroded reinforcing near South Pier. Repaired area on North span has hairline cracks with efflorescence. Impact damage on RHS on Span 2 near midspan.
2 Wearing Surface (P)		99			1		Asphalt overlay over concrete deck, minor wearing and ravelling. Minor depression at the NE corner (0.45x0.3x0.03m). Delamination area 0.5x1m at SE corner of the overlay.
3 Deck Joints (S)						N	No specific joint observed. No vertical misalignment between deck and approches.
4 Curbs/Wheelguards (P,S)		98			2		Light scaling typical throughout. 0.8m long delamination at the NE end of curb. Same size delamination at NW end of curb has been previously repaired.
5 Sidewalk(s) (P,S)						N	
6 Railings/Parapets (S)		74	2	24			Posts - light localized corrosion, 80% of cut bolt ends are rusty, 1 post (5th from north on E side) is deformed at the bottom due to possible debris collision. Top rail - splits/check/rotting throughout. Bottom rails (x2) - localized minor splits and checks.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)		100					Minor dirt accumulation in drains.
9 Coating (Railings) (S)		100					Light localized corrosion at all railing posts, no section loss observed.
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		95	5				
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
3

Urgency Rating Notes:
- Repair delaminated and spalled concrete on deck soffit and girder units
- Repair delaminated NE end of the curb.
- Recommend regrading embankments and installing suitable slope protection beneath bridge.

001 – View of Bridge – looking North

002 – Delamination area at SE corner of the deck

003 – View of Bridge – looking South

004 – Typical asphalt crack at joints

005 – 0.8m long delamination at North end of East side curb

006 – Typical decay at the top rail

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B1 – Lions Bay Avenue over Harvey Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 09, 2017	PAGE:	1	OF	4

007 – Top rail misalignment; deformed post (5th from North on East side)

008 – Deformation at the bottom of the post (5th from North on East side)

009 – Watermain on East side; spalling and exposed reinforcement bars typical throughout

010 – Pier 2 and South Abutment

011 – Severe scour at the South Abutment; Scour observed at North Abutment as well

012 – Spalling with exposed corroded reinforcing on soffit, typical

013 – Hairline cracks at soffit, typical

014 – Light Spalling from impact damage on Girder 1 midspan

015 – Pier 1, typical delaminations at Pier to Soffit interface with rust staining.

016 – Main at West side, typical exposed rebars

017 – Pier 1 and North Abutment

018 – Scour at North Abutment

019 – Previous repairs at the soffit and Girder 2

020 – Utilities under the bridge at North Abutment

021 – Looking Upstream

022 – Looking Downstream

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 02

GPS Readings: LC, N: 5478793.91 E: 482728.29

HC, N: 5478808.46 E: 482733.26

Inspection Type: L1 **Inspection Date:** 9-Nov-17

Structural Material: Precast Concrete Box Girders

Location: Isleview Place over Alberta Creek, Village of Lions Bay

Construction Date: 1986

Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey

Time: 9:00 A.M. **Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour noted. Vegetation growth in channel
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		93	7				Light scaling typical throughout with localized hairline cracks. Light spall under G1 on South Abutment with exposed corroded reinforcing. Localized efflorescence under G2-G3 at base of wall on South Abutment and at construction joint. Medium horizontal crack at construction joint on South Abutment. Efflorescence typical at construction joint on North Abutment and under G3-G4. Evidence of leaking at abutments and vegetation growth.
3 Wing/Retaining Walls (S)						x	Unable to inspect due to access/vegetation.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)	100						Limited access due to visibility. No material defects noted.
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)	100						No material defects noted on girders.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		99	1				Concrete deck, normal wearing/light scaling typical. Vertical displacement at approaches are 30mm at N and 15mm at S; ~50mm wide strip along the deck width at both N and S end with scaling and abrasion signs. At North end 2 spalled areas (70x20x20mm deep, 500x80x15mm deep).
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)		100					Light scaling typical throughout.
5 Sidewalk(s) (P,S)		95		5			Transverse cracks with efflorescence typical on underside of sidewalk/curb. Light scaling typical on remainder. Spall 0.2x0.1x0.05m deep on the surface of sidewalk at N end.
6 Railings/Parapets (S)		97	1	2			Posts - 2 anchors bolts are insufficient length (2nd post from S at East side, and 1st post from N at West side). Rails (x4 on each side) - 30% of splice bolts are rusty, 1 loose bolt at the splice at 2nd rail from top at N side, 1.3m deformed top rail at SW corner.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)	100						Drains are functioning.
9 Coating (Railings) (S)		100					
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		98			2		
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
4

Urgency Rating Notes:

- Remove vegetation from abutments and sidewalk
- Seal sidewalk, curbs, and deck
- Clear vegetation and debris in gaps between deck and approaches, fill the gap to eliminate grade differential.
- Repair spall at the North end of deck and repair cracked North approach secition.

001 – View of Bridge looking North

002 – Typical gap between deck and approach

003 – Cracks at North Approach

004 – Minor spall at sidewalk edge on North side

005 – Vegetation growth over sidewalk, typical

006 – Deformed rail on West side

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B2 – Isleview Place over Alberta Creek**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**	BY:	MK
DATE:	November 09, 2017	PAGE: 1	OF 3

007 – Anchor bolts of insufficient length (2 locations)

008 – Loose splice bolt at West side railing

009 – North Abutment. Note vegetation growth.

010 – South Abutment. Note vegetation growth.

011 – Vegetation is growing between girders and abutments

012 – Typical transverse cracks with efflorescence at the underside of sidewalks

013 – Transverse cracks with efflorescence at the underside of sidewalks typical.

014 – Transverse cracks with efflorescence at the underside of curb typical.

015 – Typical clean drain

016 – View Upstream

017 – View Downstream

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 03

GPS Readings: LC, N: 5478808.22 E: 482775.44
HC, N: 5478790.99 E: 482774.8

Inspection Type: L1 **Inspection Date:** 9-Nov-17

Structural Material: Precast Concrete Box Girders

Location: Isleview Place over Alberta Creek, Village of Lions Bay

Construction Date: 1986

Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey

Time: 10:15 A.M. **Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					Minor scour in front of abutment wall. Vegetation growth in channel
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		97	3				Light scaling typical throughout with localized hairline cracks. Localized areas of efflorescence on both Abutment walls. Vegetation growth typical on both walls.
3 Wing/Retaining Walls (S)		100					Limited inspection due to access. Light scaling typical on accessible wall with horizontal hairline cracks.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)	100						Limited inspection due to visibility. No material defects noted.
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)	96		1	5			Active leaking between girder units at South end. Light spall on G1 and G3 approximately 4 metres from South Abutment.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		98	1	1			Concrete deck, normal wearing/light scaling typical. Minor depression 0.16x0.08x0.01m deep at SE corner. At both ends, ~50-70mm wide strip with signs of abrasion and spalling due to grade differential with approaches. Chipped off edge at SW corner ~0.5x0.25x0.04m deep.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)		100					Light scaling typical throughout.
5 Sidewalk(s) (P,S)		96		4			Transverse cracks with efflorescence typical on underside of sidewalk. Light scaling typical on remainder.
6 Railings/Parapets (S)		98	1	1			Railing is in good condition in general. Light corrosion at top rail bolts, 2splice bolts missing (2nd rail from top on both East and West side), 1 anchor bolt is too short (3rd post from South on West side).
7 Median Barrier (S)						N	
8 Drains/Pipes (A)	100						
9 Coating (Railings) (S)		100					
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		88			12		
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
4

Urgency Rating Notes:

- Seal sidewalk, curb and deck
- Clear vegetation and debris in gaps between deck and approaches, fill the gap to eliminate grade differential.
- Repair debonded asphalt and seal the crack at approaches.
- Repair spall at the South end of deck.

001 – View of Bridge looking South

002 – Sidewalk Overview

003 – South Approach – Gap between deck and approach

004 – Crack in asphalt at South approach, West side

005 – North Approach – Gap between deck and approach

006 – Crack in asphalt at North Approach, West side

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B3 – Isleview Place over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 09, 2017	PAGE:	1	OF	4

007 – Missing splice bolt at West side railing

008 – Rusting bolt at the railing post

009 – Rusty bolts at the railing, typical

010 – South Abutment. Note vegetation growth.

011 – Vegetation at S approach, evidence of water leaking between girders

012 – North Abutment. Note vegetation growth.

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B3 – Isleview Place over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 09, 2017	PAGE:	2	OF	4

013 – Vegetation growth between abutment wall and underside of girders.

014 – Main at North Abutment

015 – Transverse cracks with efflorescence on the underside of sidewalk typical

016 – Northwest Wingwall

017 – Hairline cracking at North Abutment wall

018 – Vegetation growth onto the curb

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B3 – Isleview Place over Alberta Creek

PROJECT : 31935 NAME:

LOCATION: Village of Lions Bay

CLIENT: **Village of Lions Bay** BY: MK

DATE: November 09, 2017 PAGE: 3 OF 4

019 – Transverse cracks with efflorescence on the underside of curb typical.

020 – View downstream

021 – View upstream

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B3 – Isleview Place over Alberta Creek**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**	BY:	MK
DATE:	November 09, 2017	PAGE: 4	OF 4

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 04

GPS Readings: LC, N: 5478438.26 E: 482942.11
HC, N: 5478448.72 E: 482937.07

Inspection Type: L1 **Inspection Date:** 8-Nov-17

Structural Material: Precast Concrete Box Girders

Location: Cross Creek Road over Harvey Creek, Village of Lions Bay

Construction Date: 1986

Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey

Time: 12:30 P.M. **Weather:** Sunny, 13 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)	100						No noticeable debris build up upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour. Vegetation growth on channel walls.
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		97	2	1			Light scaling typical throughout with localized hairline cracks. Vertical hairline crack with efflorescence at centre of wall and efflorescence deposits under G4 and G8 on North Abutment. Very severe delamination on South Abutment under G6 with associated wide crack and rust staining. Localized rust staining in multiple locations. Evidence of leaking on both abutments
3 Wing/Retaining Walls (S)		95	5				Limited inspection due to access/vegetation. Light scaling typical throughout. Efflorescence at crack location on Southwest wingwall.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)	100						Limited inspection due to visibility. No material defects noted.
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)	80	2		18			Light scaling at deck drain locations. Evidence of leaking through units G5-G6 with efflorescence present typical full length of bridge. Evidence of leaking through units G7-G8 at midspan. Evidence of leaking typical at South end between all units.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		98		1	1		Asphalt overlay at concrete deck. Crack up to 2mm wide along the whole length of bridge at W side, ~1.2m from centerline; crack and water leaks seen underneath the bridge at the same location. Delamination area (possible only of ashpalt overlay) 1.6x0.6m at NW corner and 1.3x0.6m at SE corner.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)						N	
5 Sidewalk(s) (P,S)		98		2			Transverse cracks with efflorescence typical on underside of sidewalk. Light scaling typical on remainder. Noted damage to conduit on upstream side. Vegetation growth on exterior vertical face.
6 Railings/Parapets (S)		100					
7 Median Barrier (S)						N	
8 Drains/Pipes (A)	100						Drains are functioning. Note drains are flush with girder units below bridge.
9 Coating (Railings) (S)						N	
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		99	1				
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
4

Urgency Rating Notes:

- Recommend extending drains beneath bridge
- Seal sidewalks. Rout and seal crack on wearing surface
- Seal cracks in asphalt at approaches.

001 – View of Bridge looking North

002 – West sidewalk

003 – East sidewalk

004 – South Approach

005 – Delamination area at South-East side of deck

006 – Spalls in asphalt on South approach

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B4 – Cross Creek Road over Harvey Creek**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**	BY:	MK
DATE:	November 08, 2017	PAGE: 1	OF 6

007 – North Approach

008 – Delamination area at North-West side of deck

009 – Utilities at North-East corner of the bridge

010 – Typical Railing

011 – Misalignment of railings at North-West corner

012 – Misalignment of deck and retaining wall North of bridge at West side

013 – North-East corner

014 – Settlement at the North-East corner

015 – Southbound lane

016 – Longitudinal crack at SB lane

017 – Rusty bolts at railing, typical

018 – Transverse cracks with efflorescence on underside of West sidewalk, similar observed at East sidewalk

019 –West corner of North Abutment

020 – North Abutment overview

021 – North Abutment: vertical hairline crack with efflorescence, localized rust staining

022 – Evidence of leaking at North Abutment

023 – South Abutment overview

024 – South Abutment: efflorescence deposits, water leaking signs, horizontal cracks with rusting

025 – South Abutment: horizontal cracks with rust staining

026 – Drains are flush with girders

027 – Leaking through Girders 5 and 6 with efflorescence

028 - Leaking between girders

029 – North corner of West sidewalk – minor spall

030 – Watermain on East side

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B4 – Cross Creek Road over
PROJECT : 31935 NAME: **Harvey Creek**

LOCATION: Village of Lions Bay

CLIENT: **Village of Lions Bay** BY: MK

DATE: November 08, 2017 PAGE: 5 OF 6

031 – South Abutment, East side

032 – South Abutment, East side

033 – View downstream

034 – View upstream

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B4 – Cross Creek Road over Harvey Creek

PROJECT : 31935 NAME:

LOCATION: Village of Lions Bay

CLIENT: **Village of Lions Bay** BY: MK

DATE: November 08, 2017 PAGE: 6 OF 6

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 05

GPS Readings: LC, N: 5478738.02 E: 482930.36

HC, N: 5478721.34 E: 482933.5

Inspection Type: L1 **Inspection Date:** 8-Nov-17

Structural Material: Precast Concrete Box Girders

Location: Bayview Road over Alberta Creek, Village of Lions Bay

Construction Date: 1986

Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey

Time: 8:30 A.M. **Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour noted. Vegetation growth in channel
3 Dolphins/Fenders (A)							
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		97	2	1			Light scaling typical with localized hairline cracks. Localized medium delamination on South Abutment under Girders 4 and 5. Localized light spall under G7. Localized efflorescence under G7 near top of wall and at base of wall in the centre on South Abutment. Evidence of leaking at exterior girder units and at centre on South Abutment. Medium horizontal crack on top of South Abutment wall under G4. Vegetation growth on North Abutment.
3 Wing/Retaining Walls (S)						x	Unable to inspect due to access/vegetation.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)	100						Limited inspection due to visibility. No material defects noted.
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)	98			2			Evidence of leaking between G3-G4 approximately 3m from South Abutment, G5-G6 approximately 3m from South Abutment and North Abutment
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		96	1	3			Concrete deck, normal wearing, light scaling typical throughout. Longitudinal hairline cracks at middle of each driving lane. Spalling/abrasion at the NE and SW ends of the deck.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)		100					
5 Sidewalk(s) (P,S)		98		2			Transverse cracks with efflorescence typical on underside of sidewalk. Light scaling typical on remainder.
6 Railings/Parapets (S)		100					Light corrosion on the splice bolts.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)	100						Drains are functioning
9 Coating (Railings) (S)						N	
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		96	3	1			
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
4

Urgency Rating Notes:

- Remove vegetation from abutment. Repair delaminated concrete.
- Seal sidewalk, curb, and deck
- Repair broken up asphalt at South approach, regrade to eliminate grade differential.

001 – View of Bridge looking North

002 – View of South Approach

003 – Asphalt cracking at South Approach

004 – Gap between deck and asphalt at South Approach

005 – Barrier detached at South-West corner

006 – View of North Approach

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B5 – Bayview Road over Alberta Creek**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**	BY:	MK
DATE:	November 08, 2017	PAGE: 1	OF 4

007 – Longitudinal hairline crack at SB lane (similar at NB lane)

008 – Hairline crack at SB lane on Deck

009 – Typical Railing with minor corrosion on top bolts

010 – South Abutment

011 – South Abutment: evidence of leaking at East side

012 – South Abutment: evidence of leaking at West side, localized medium delamination under Girders 4 and 5

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B5 – Bayview Road over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	2	OF	4

013 – South Abutment: medium hairline crack under Girder 4

014 – Localized efflorescence between girders

015 – Localized staining between girders

016 – Vegetation growth on North Abutment

017 – Curb underside. Note transverse cracks with efflorescence.

018 – Typical transverse cracks with efflorescence on the underside of sidewalk

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B5 – Bayview Road over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	3	OF	4

019 – Watermain on East side

020 – View downstream

021 – View upstream

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B5 – Bayview Road over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	4	OF	4

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 06

GPS Readings: LC, N: 5478715.95 E: 482948.92
HC, N: 5478736.6 E: 482958.98

Inspection Type: L1 **Inspection Date:** 8-Nov-17

Structural Material: Steel Superstructure with Timber Deck

Location: Bayview Road over Alberta Creek (Private Driveway), Village of Lions Bay

Construction Date: 1986

Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey

Time: 9:00 A.M. **Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour noted. Vegetation growth in channel
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		100					Light scaling typical throughout with localized hairline cracks.
3 Wing/Retaining Walls (S)		100					Limited inspection due to vegetation build up and access. Light scaling typical throughout.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)						N	
7 Caps (S)				100			Splitting/Crushing typical under girders at both ends.
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)			79	21			Extensive checks/splits and light weathing typical throughout each floor beam. Suspected severe rotting in Floor Beam 13, 15, 17, 18, 20. Splitting on Floor Beam 5.
2 Stringers (P)						N	
3 Girders (P)				100			Medium corrosion typical on top and bottom flangers with section loss of < 15%. Light corrosion typical on web.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)				68	32		Medium corrosion typical on all members. Permanent deformation on multiple diaphragms (D3, D7, D9). Permanent deformation on multiple cross bracings (CB2, CB4, CB6, CB7, CB8).
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)			20	80			Coating has failed on interior faces of Girders and all diaphragms and cross bracing. Bottom face of the flange and exterior face have Category 4 surface rusting and pinholing typical throughout.
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		100					Normal wearing, minor checking.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)			100				Wheelguard 0.3x0.3m section. Minor checks and split throughout, deep checking in some areas.
5 Sidewalk(s) (P,S)						N	
6 Railings/Parapets (S)			53	29	18		Posts are 140x190mm, majority has significant splits and checks, signs of decay, 8 posts are crushing (very poor). Horizontal rails are in generally fair condition with some areas with severe splitting, generally soft wood. Vertical planks are generally in fair condition with some splits/checks.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)						N	
9 Coating (Railings) (S)						N	
E. APPROACHES:							
1 Signing/Lighting (A)						N	
2 Roadway Approaches (S)		100					
3 Roadway Flares (S)						N	
4 Approach Drainage						N	
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
3

Urgency Rating Notes:

- Recommend replacing floor beams
- Recommend recoating steel superstructure.
- Recommend repairing connection at Diaphragm 3 and deformed secondary members.
- Recommend replacing guradrail system.

001 – View of Bridge looking North

002 – Retaining wall at South Approach

003 – Typical Railing

004 – Typical Railing condition – significant checks, signs of decay

005 – Typical Post: soft timber, splits

006 – 8 posts are failing (significant crushing)

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B6 – Bayview Road over Alberta Creek (Private Driveway)

PROJECT :	31935	NAME:			
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	1	OF	4

007 – Typical Post connection to wheelguard

008 – Normal wearing at deck with minor checking

009 – South Abutment

010 – South Abutment Bearing. Note severe cracks and crushing.

011 – Bearing at South Abutment. Note severe cracks and crushing.

012 – North Abutment

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B6 – Bayview Road over Alberta Creek (Private Driveway)

PROJECT :	31935	NAME:			
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	2	OF	4

013 – North Abutment Bearing. Note severe crushing.

014 – Bearing at North Abutment. Note severe crushing.

015 – Girders and diaphragms overview – medium corrosion on flanges and light corrosion on web. Note permanent deformation on cross bracing.

016 – Floor beams with extensive checks/splits typical.

017 – Typical Connection – medium corrosion

018 – Medium corrosion on all bracing/diaphragm members

019 – Typical Diaphragm

020 – Girder Exterior typical. Note surface rusting through coating.

021 – Suspected rotting at floor beams

022 – View upstream

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B6 – Bayview Road over Alberta Creek (Private Driveway)**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**	BY:	MK
DATE:	November 08, 2017	PAGE: 4	OF 4

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name:	**Bridge 07**		**Structural Material:**	**Precast Concrete Box Girders**	
GPS Readings:	**LC, N:** 5478679.92	**E:** 483025.19	**Location:**	**Bayview Place over Alberta Creek, Village of Lions Bay**	
	HC, N: 5478699.12	**E:** 483033.29	**Construction Date:**	1986	
Inspection Type:	L1	**Inspection Date:** 8-Nov-17	**Inspector:**	Luc Bittner/Maria Kapiturova	**Checked by:** Dan Estey
			Time:	11:15 A.M.	**Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING

Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour noted. Vegetation growth in channel
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)		100					Settlement at approaches.
2 Abutments (P)		97	1.5	1.5			Light scaling typical with localized hairline cracks. Very severe delamination under G4 at the top of the wall and localized efflorescence under G4 on North Abutment. Localized efflorescence under G1 on South Abutment. Evidence of leaking at exterior girder units. Vegetation growth typical.
3 Wing/Retaining Walls (S)						x	Unable to inspect due to access/vegetation.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)	100						Limited inspection due to visibility. No material defects noted.
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)	99.5		0.5				Localized light spall on G1 near midspan. Note that conduit is also damaged in same location. Vegetation growth between units G3-G4 at both abutments.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						N	
2 Wearing Surface (P)		100					Concrete deck, normal wear. Minor spalling/abrasion at S end.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)		100					
5 Sidewalk(s) (P,S)		98		2			Transverse cracks with efflorescence typical on underside of sidewalk. Light scaling typical on remainder.
6 Railings/Parapets (S)		99		1			1 anchor bolt is missing at 3rd post from N at West side. Top splice bolts on rails have minor corrosion.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)	100						Drains are functioning.
9 Coating (Railings) (S)						N	
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		95	5				
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
4

Urgency Rating Notes:

- Remove vegetation growth on abutments and between girder units. Repair delaminated concrete on abutment.
-Seal sidewalk, curb, and deck
- Clear gaps between approaches and deck, regrade to eliminate grade differential.
- Install/repair missing anchor bolt at the post.

001 – View of Bridge looking North

002 – View of North Approach

003 – Gaps between deck and asphalt at North Approach

004 – Scaling on deck NW corner

005 – South Approach gap between deck and asphalt

006 – Vegetation in the gap and abrasion at the deck due to uneven elevation at South Approach

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B7 – Bayview Place over Alberta Creek

PROJECT : 31935 NAME:

LOCATION: Village of Lions Bay

CLIENT: **Village of Lions Bay** BY: MK

DATE: November 08, 2017 PAGE: 1 OF 4

007 – Efflorescence at the curb at North-West end

008 – Typical Railing

009 – Missing anchor bolt at 3rd post from North on West side

010 – Close up of missing anchor

011 – South Abutment

012 – Leaking at exterior girder units at South Abutment

013 – Leaking at exterior girder units at North Abutment

014 – Vegetation growth at North Abutment

015 – Severe delamination area at North Abutment, West side

016 – Main at East side

017 – Damage at watermain cover

018 – Transverse cracks with efflorescence on underside of sidewalk and curb typical.

019 – Typical bearing

020 – Underside of girders - overview

021 – View downstream

022 – View upstream

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B7 – Bayview Place over Alberta Creek**		
LOCATION:	Village of Lions Bay				
CLIENT:	**Village of Lions Bay**			BY:	MK
DATE:	November 08, 2017	PAGE:	4	OF	4

LION'S BAY BRIDGE INSPECTION PROGRAM

Structure Name: Bridge 08
GPS Readings: LC, N: 5478802.71 E: 482654.4
HC, N: 5478819.03 E: 482659.67
Inspection Type: L1 **Inspection Date:** 9-Nov-17

Structural Material: Single Span Concrete Bridge
Location: Lions Bay Avenue over Alberta Creek (Private Driveway), Village of Lions Bay
Construction Date: 1986
Inspector: Luc Bittner/Maria Kapiturova **Checked by:** Dan Estey
Time: 1:00 P.M. **Weather:** Cloudy, 8 °C

PERCENT COMPONENT CONDITION RATING
Enter % in each condition.

	E	G	F	P	V	N/X	**INSPECTION EXPLANATION OR DESCRIPTION**
A. CHANNEL:							
1 Debris Risk (A)		100					Minor build up of debris upstream.
2 Bank/Bed Scour/Buildup (P,S)		100					No evidence of scour noted. Vegetation growth in channel
3 Dolphins/Fenders (A)						N	
B. SUBSTRUCTURE:							
1 Foundation Movement (P)							No evidence of movement noted.
2 Abutments (P)		100				x	Limited inspection due to access. Vegetation growth on abutment walls.
3 Wing/Retaining Walls (S)						x	Unable to inspect due to access.
4 Footings/Piling (P)						x	
5 Pier Columns/Walls/Cribs						N	
6 Bearings (S)						N	
7 Caps (S)						N	
8 Corbels / Bridge Seats (S)						N	
C. SUPERSTRUCTURE:							
1 Floor Beams/Transoms (P)						N	
2 Stringers (P)						N	
3 Girders (P)						x	Unable to inspect due to access.
4 Portals (P)						N	
5 Bracing/Diaphragms (S)						N	
6 Truss Chords/Arch Ribs (P)						N	
7 Arch Ties (P)						N	
8 Truss Diagonals (P)						N	
9 Truss Rods/ Verticals (P)						N	
10 Cables (P)						N	
11 Panels (S)						N	
12 Pins/Bolts/Rivets (P)						N	
13 Camber/Sag (S)						N	
14 Live Load Vibration (S)						N	
15 Coating (structure) (P,S)						N	
D. DECK:							
1 Sub Deck/Cross Ties (P)						x	Unable to inspect due to access.
2 Wearing Surface (P)		100					Concrete deck, normal wearing, light scaling typical. Noted ponding water in multiple locations.
3 Deck Joints (S)						N	
4 Curbs/Wheelguards (P,S)				100			Wheelguard 0.3x0.2m, deep splitting and checks/splits, soft wood, signs of decay.
5 Sidewalk(s) (P,S)						N	
6 Railings/Parapets (S)				100			Horizontal rails 90x90mm section - significant splits, sings of decay. Vertical planks 90x10mm - in fair condition, connections are poor. In general, railing system is not designed to withstand vehicle collision load and recommended to be replaced.
7 Median Barrier (S)						N	
8 Drains/Pipes (A)						N	
9 Coating (Railings) (S)						N	
E. APPROACHES:							
1 Signing/Lighting (A)		100					
2 Roadway Approaches (S)		99	1				
3 Roadway Flares (S)						N	
4 Approach Drainage		100					
5 Utility Concerns? (A)						N	

Component Category: P = Primary S = Secondary A = Auxiliary

Component Condition Codes		
E – Excellent	5	N – Not Applicable
G – Good	4	X – Cannot Inspect
F – Fair	3	
P – Poor	2	
V – Very Poor	1	

Condition Rating
G
Urgency Rating
3

Urgency Rating Notes:
- Recommend replacing guardrail system.
- Remove vegetation at the abutment walls.
- Recommend inspection of soffit and abutments with rope access or drone.

001 – View of Bridge looking North

002 – South Approach

003 – Minor gap between deck and asphalt at South approach

004 – 15mm difference in elevation between deck and asphalt at North approach

005 – Typical railing

006 – Vertical plans in fair condition, all connections are poor (not adequate for load)

ISL Engineering and Land Services

Close Proximity Bridge Inspections
B8 – Lions Bay Avenue over
PROJECT : 31935 NAME: **Alberta Creek (Private Driveway)**

LOCATION: Village of Lions Bay

CLIENT: **Village of Lions Bay** BY: MK

DATE: November 09, 2017 PAGE: 1 OF 3

007 – Deep splits/checks, rot throughout wheel guard

008 – Significant splits/checks, signs of decay at horizontal rails

009 – South Abutment Overview

010 – North Abutment Overview – vegetation overgrowth; water main on the East side of the bridge

ISL Engineering and Land Services

PROJECT :	31935	NAME:	**Close Proximity Bridge Inspections B8 – Lions Bay Avenue over Alberta Creek (Private Driveway)**
LOCATION:	Village of Lions Bay		
CLIENT:	**Village of Lions Bay**		BY: MK
DATE:	November 09, 2017	PAGE: 2	OF 3

011 – Water main is damaged in several sections

012 - Soffit overview, leakage through the bolts (hold down wheel guard)

013 - Soffit and bolt close up